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Has International Trade Affected Workers' Bargaining Power?

by

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DISCUSSION
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Has International Trade Affected Workers' Bargaining Power?

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Abstract: In this paper, we investigate whether international trade has affected workers' wages for the Belgian manufacturing industry by using a rent-sharing framework. We find that international trade affects workers' wages through changes in the profits. Our regression results reveal that increased foreign competition in the form of lower export prices reduces both wages and profits per worker. Although technological change seems important for explaining workers' (relative) bargaining powers, we also find that globalisation plays some role.

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1. INTRODUCTION

During the past decades, the labour market consequences of the international integration process have been at the centre of hot debate. Anti-globalisation protests surrounding the WTO, IMF and World Bank meetings reveal that many people fear that they will lose their job or will be confronted with lower wages because of the threat of fiercer international competition.

One strand of the literature, investigating the impact of international trade on the labour market has taken its outset in the integration of emerging economies. Compared to OECD countries, these countries have a relative large supply of unskilled workers with low wages. Accordingly, it has been a concern whether the position of unskilled versus skilled workers in OECD countries would deteriorate. This could show up either in lower relative wages and/or higher unemployment for these unskilled workers.

One favourite framework of trade economists to study the impact of international trade on the labour market, is the Hecksher-Ohlin-Samuelson theory (HOS) in which the Stolper-Samuelson (SS) theorem is an important building block. According to this theorem, the relative (real) wages of unskilled workers in OECD countries decline if the integration process is associated with a decline in relative prices of commodities using a lot of unskilled labour. However, a voluminous literature linking changes in product prices to changes in factor prices (see Slaughter, 2000, for a survey of these studies) has found that international trade can account for only a very small fraction of the deterioration of the position of unskilled workers. Instead, technological progress seems to be the main reason for observed relative wage changes.

Labour economists have mainly used the so-called Factor Content of Trade (FCT) approach. In this approach, the amount of labour (eventually split-up between skilled and unskilled workers) embodied in a country's exports and imports is calculated. Subsequently, these changes in labour flows are linked to labour demand elasticities in order to calculate the impact of international trade on wages. Except for Wood (1994), most authors also find a small to moderate impact of international trade on worker's wages.

The studies mentioned above focus on factor revenues and do not address the capture or distribution of rents in response to international trade. A growing body of the trade-labour literature has relied on rent-sharing models to explain changes in wages by changes in rents in response to openness. In rent-sharing models, workers no longer obtain the competitive wage but are able to capture a fraction of the firm's profits per worker in the form of higher wages.

Abowd and Lemieux (1993) for Canada, Borjas and Ramey (1995) for the US and Kramarz (2003) for France show how increased international competition triggers a shift in the rents from domestic to foreign firms. This leads to a change in profits of the domestic firm, which translates into wages changes in the domestic market. Fontagné and Mirza (2001) focus on trade volumes to address the international rent-sharing hypothesis in developed and developing countries. Their empirical results show that an increase in exports as well as domestic market shares induces higher wages in a number of industries in the OECD. In developing countries, such as the Mediterranean countries and those in Latin America, similar rent-sharing effects are observed. However, these effects are not present in Asia.

In this paper, we also rely on a rent-sharing framework to investigate the impact of international trade on labour market outcomes in Belgium. We argue that there are at least two valid reasons for doing so. First, Belgium is one of the most open economies in the world. More specifically, the export/GDP ratio equals 85% in 2002 compared to 10% in the US. [1] Krugman (1995) among others argues that globalisation cannot explain US labour market developments because the US economy is just not open enough for trade to matter a lot. Turning this argument around, we expect significant labour market effects from trade in Belgium. Second, the Belgian economy is characterised by the presence of wage negotiations between firms and their workers at the national, the sectoral and the firm level. Hence, this makes a rent-sharing framework very valid to explain wages in the Belgian economy.

In this paper, we focus on two issues. In the first part of the paper, we focus on the effect of international trade through changes in the firms' rents. To our knowledge, this issue has not been taken up for the Belgian economy. Veugelers (1987) and Goos and Konings (2001) examine the rent-sharing hypothesis with Belgian firm data and find a positive profit-wage relationship. However, these authors do not relate their rent-sharing framework to a story of globalisation. Following Abowd and Lemieux (1993) for Canada, which like Belgium is a typical example of a small open economy, we also use import and export prices in our analysis. However, we also experiment with other measures, such as exchange rates, to test whether increased globalisation has affected wages through changes in the firms' rents.

Whereas the studies mentioned above and our first part of this paper analyse the effect of globalisation through the *size* of the rents, we focus explicitly on the *distribution* of the rents in the second part of this paper. As pointed out by Rodrik (1997), increased international competition has led to a lower *share* of the enterprise surplus ending up with workers. A

[1] The data are obtained from the OECD International Trade Statistics and the OECD Main Economic Indicators (see http://www.oecd.org)

related consequence is that unions have become weaker. In other words, lower wages in the case of increased international competition are not only induced by a decline in the firm's rents, but can also be the result of the union's lower bargaining power. In this paper, we therefore study whether the globalisation process has influenced the nature of bargaining between workers and employees. Within this framework, we explicitly test whether in sectors characterised by strong international product market competition (measured by variables related to e.g. export and import competition, outsourcing, tariffs and foreign direct investment), workers/unions will have less bargaining power during wage negotiations.

Indirect empirical evidence for weaker unions is given by the study of Slaughter (2001) who investigates the hypothesis that trade liberalisation has contributed to increased labour demand elasticities. Using sectoral-level data, his empirical results are mixed and show that mainly time effects determine changes in labour demand elasticities of especially unskilled workers. However, a number of trade-related variables (such as outsourcing, net exports, etc.) are found to have the predicted effect on the labour demand elasticity of both production and non-production workers. As pointed out by Slaughter (2001) and Rodrik (1997), finding increased labour demand elasticities in the case of increased foreign competition could be consistent with a story of a shift from labour towards capital bargaining power over rent distribution in firms enjoying extra-normal profits.

Budd and Slaughter (2003) focus on Canada and investigate whether profits are shared across international borders. More specifically, Canadian wages are regressed on Canadian and US profits, both interacted with several variables related to international linkages such as multinational ownership, union type and tariffs and transportation costs. The empirical results regarding the profits of Canadian firms reveal that rent-sharing is less present when the Canadian firm is part of a US multinational and/or international union. When the Canadian profits are interacted with Canadian tariffs on US imports and transportation costs, the results reveal that higher Canadian profits are related to higher wages but there is no variation in rent-sharing across tariff levels and transport costs. In this paper, we further investigate whether increased globalisation has indeed an effect on the workers' bargaining power.

Veugelers and Konings et al. (2000) for Belgium and Svejnar (1986) for the US (1989) point out that there is indeed a lot of cross- industry variation in the relative bargaining power coefficient. Svejnar and Veugelers further investigate the determinants of this cross-industry variation of the bargaining power coefficient. Although a well-developed theory of these determinants of relative bargaining power is lacking, these authors link the sectoral bargaining power parameters to variables relating to the economic bargaining environment

such as the consumer price index, the sectoral unemployment rates and several variables capturing output market concentration. However, they do not relate the workers' bargaining power to globalisation. More specifically, we use a two-stage approach in which we first estimate the workers' (relative) bargaining approach for each sector following Veugelers (1987) and Svejnar (1986). With the aid of a unique data set encompassing the entire population of Belgian firms, we are able to split up our data into several sectors.[2] In the second stage, we relate the workers' (relative) bargaining power of each sector and year to a broad range of globalisation measures such as trade, outsourcing, tariffs and measures related to foreign direct investment.

The organisation of the paper is as follows. In Section 2, we present the theoretical framework and also present an overview of the literature how international trade can affect wages in a wage bargaining framework. Section 3 presents the regression results of the first stage. Section 4 focuses on the determinants of the workers' bargaining power and hence deals with the regression results of the second stage. The paper ends with a summary of the main results and points out some extensions for future work.

2. THEORETICAL FRAMEWORK

The methodology in this paper borrows from the rent-sharing literature. A lot of papers deal with this issue and investigate the link between a firm's ability to pay and the workers' wages. Within this framework, workers no longer obtain the competitive wage but are able to capture a fraction of the firm's profits per worker in the form of higher wages.

In this section, we first describe the efficient bargaining framework. Then, we briefly discuss the three channels through which international trade can affect wages during the bargaining process.

[2] Our dataset has the advantage of being a more exhaustive dataset in comparison to the Amadeus dataset of the Bureau van Dijck which is another firm-level database as this dataset only contains firms satisfying at least one of the following criteria: number of employees greater than 100, total assets and operating revenues exceeding 16 million and 8 million USD, respectively.

2.1. Efficient bargaining framework

The union and the firm are involved in an efficient bargaining procedure, with both real wages (w) and employment (N) as the subject of agreement (McDonald and Solow, 1981). Relying on the Efficient Bargaining model is motivated by stylised facts about Belgian industrial relations, i.e. Belgian collective agreements do not only deal with wages but also with employment issues like hours of work and part-time labour policies (Bughin, 1996). Microeconomic evidence in favour of Efficient Bargaining for Belgium has been provided by e.g. Bughin (1993). We introduce the following Nash bargaining product from which we will determine the bargained wages:

$$\underset{w,N}{Max}\,\Omega = \left(U(w,N)-U^{0}\right)^{\beta}\left(\pi(w,N)-\pi^{0}\right)^{1-\beta} \qquad (1)$$

with U denoting the utility function of the union, π the firm's profit, N the firm's labour demand, $\beta \in [0,1]$ represents the union's bargaining power and U^{0} and π^{0} are the threat points of respectively the union and the firm. These threat points are the payoffs when no agreement is reached.

The union is risk neutral[3] and its objective function is specified in a utilitarian form: $U(w,N) = Nw + \left(\overline{N} - N\right)w_a$, where $\overline{N}$ is union membership $\left(0 < N \le \overline{N}\right)$ and $w_a \le w$ is the alternative wage (i.e. a weighted average of the alternative market wage and the unemployment benefit).

The firm's utility equals its profits π, with $\pi(w,N) = R(N) - wN - F$, where $R = PQ$ stands for total revenue $\left(R_N'' < 0\right)$, P for the output price, Q for output and F for all other costs associated with production. For simplicity, we assume that labour is the only variable input for the firm. Hence, F represents fixed costs. It can be shown that this assumption on the fixed nature of inputs other than labour does not affect the bargaining outcome provided the union preferences do not depend on those inputs (Bughin, 1996).

The threat points refers to the payoffs in case no agreement between the workers and the firm is reached. The threat point for the union is assumed to be equal to the alternative wage w_a.[4] If no revenue accrues to the firm when negotiation breaks down, the firm's fallback

[3] See Svejnar (1986) and Veugelers (1987) among others for the derivation of the case of a risk-averse union.

[4] It is not necessary for the unions' threat point to be equal to the alternative wage (see e.g. Mc Donald and Suen ,1992, and Layard et al., 1991, for a discussion). Blanchflower et al. (1996) interpret the workers' threat point as the wage of temporary work in case of a breakdown in bargaining. Others such as Layard

utility equals $-F$. The outcome of the bargaining of the asymmetric generalised Nash solution therefore reduces to:

$$\underset{w,N}{Max}\,\Omega = \left(Nw + \left(\overline{N} - N\right)w_a - \overline{N}w_a\right)^{\beta}\left(R - wN\right)^{1-\beta} \tag{2}$$

Maximisation of equation (2) with respect to the wage rate (w) gives the following equation:

$$w = w_a + \frac{\beta}{1-\beta}\left[\frac{R - wN}{N}\right] \tag{3}$$

Maximising equation (2) with respect to employment (N) leads to the following first-order condition:

$$\begin{aligned} w &= R_N + \frac{\beta}{1-\beta}\left[\frac{R - wN}{N}\right] \\ &\Updownarrow \\ w &= R_N + \beta\left[\frac{R - R_N N}{N}\right] \end{aligned} \tag{4}$$

From equation (4), it follows that unions extract a rent from bargaining, expressed as a premium over the marginal revenue of labour **(R_N)**.

By solving simultaneously both first-order conditions, we obtain an expression for the contract curve, which results from the tangency between iso-profit curves and union indifference curves: $R_N = w_a$. This equation shows that the employment level depends on the alternative wage (w_a) but not on the negotiated wage (w). It also follows that the contract curve outcome is to the right of the labour demand curve. The first-order condition related to optimal employment, equation (4) shows the extent to which the bargaining outcome is off the labour demand curve.

2.2. Channels through which international trade affects wages in a bargaining framework

Theoretically, there are three channels through which product market integration (globalisation) can affect wages during the bargaining process (see equation (3)).

First, international trade can induce movements in the firm's financial conditions π, i.e. affecting the *size* of the rents (or the 'pie') that can be shared between the workers and the

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et al. (1991) also refer to the threat point as the income received from strike pay or from unemployment benefits in case these are payable.

firm. Abowd and Lemieux for Canada (1993) and Kramarz (2003) for France use foreign competition shocks as an exogenous source of variation in product market conditions to identify the effect of the firm's financial conditions on negotiated wages. The results of Abowd and Lemieux reveal that foreign import competition in the form of lower import or export prices lower both wages and quasi-rents per worker. Moreover, the effect on the quasi-rents is larger than on the wages which implies that workers are not able to capture all the changes in quasi-rents induced by changes in import and export prices. Kramarz uses US export prices to determine the effect on (quasi)-rents and hence wages. He finds that export prices of US firms to OECD countries increase French quasi-rents. US export prices to Eastern European countries and oil-producing countries decrease French quasi-rents. Kramarz considers the first as a potential proof of increased import competition while the latter can be consistent with an increase in oil prices.

Second, international trade can affect the bargaining outcome through movements in the firms' and the workers' threat points. Biscourp and Kramarz (2002) and Kramarz (2003) show how intermediate imports may act as substitutes for part of the labour input. Firms that use intermediate inputs in the production process have to announce the amount of imports well in advance. In other words, these intermediate imports can be seen as investments that influence the firm's threat point and provide the workers with hold-up opportunities (Malcomson, 1997). More specifically, Kramarz (2003) shows that there is a positive relation between the firms' intermediate imports and the workers' wages. At the same time, imports of finished goods by the firm itself or by its competitors decrease the workers' outside options (Kramarz, 2003). During wage negotiations, the workers have possible access to other jobs in case the bargaining breaks down. The availability of these temporary jobs is inversely related to the amount of imported finished goods in an industry (see Kramarz, 2003, p. 6, for a discussion).

The empirical results of Kramarz for France reveal that increased import competition not only influences wages through changes in the quasi-rents but increased import competition, working through the workers' threat point, has also a negative effect on the workers' wages.

The third channel through which international trade can influence wages using a wage bargaining framework is through the workers' bargaining power parameter β. There are two solution concepts within the bargaining framework: the axiomatic approach and the strategic approach. The static axiomatic (normative) approach concentrates on the *outcome* of the

bargaining process satisfying certain principles that might be achieved by an objective arbitrator in case of disagreement between the parties (Booth, 1995).[5]

The dynamic game-theoretic (strategic) approach involves modelling the bargaining *process* in order to determine the actual outcome. It can be shown that in a simple 'alternating offers model' with no uncertainty, the game-theoretic solution equals the generalized Nash Bargaining solution (see Sutton, 1986, and Binmore et al., 1986, for an extensive comparison of both approaches). More specifically, the outcome of a bargain can be compared to the division of a continuous supply of a cake between two parties (see Layard et al., 1991, for an interpretation). Binmore et al. (1986) show that when two assumptions are fulfilled, the cake would be equally split. These assumptions are: both parties have the same discount rate and neither party gets any extra income from other sources while disagreement is going on.

The real advantage of the game-theoretic approach is that an economic interpretation can be given to the bargaining power parameter β (see Booth, 1995). First, in models where parties discount the future and hence, where delay of a settlement diminishes the present value of the result, the workers' bargaining power will be higher if workers have a lower discount rate than the employers and are hence less willing to have a disagreement.[6] Reasoning in this way, Lindén (1995) defines β as the ratio of the hiring rate from the unemployed to the sum of the hiring rate and the rate of filling vacancies (and hence on the labour market tightness) in an equilibrium search model. The more impatient the employer or the tighter the labour market, the higher the bargaining strength of the union and vice versa. Therefore, measures related to globalisation could have an impact on the tightness on the labour market and hence on the unions' bargaining power. Higher import competition (export competition) could decrease (increase) the workers' bargaining power as the labour market become less (more) tight. Second, β can be interpreted as the ratio of the parties' perceived risk that the other party will leave the bargaining table (Binmore et al., 1986, Donald and Suen, 1992, and Teulings and Hartog, 1998). More specifically, the unions' and the firms bargaining power is related to the costs or benefits of both parties in delaying an agreement (Smith, 1996, and Layard et al., 1991).[7] More specifically, if a bargaining partner receives extra income in case of a disagreement, this partner is more willing to tolerate disagreement and hence bargain for

[5] These axioms are invariance, Pareto efficiency, independence or irrelevant alternatives and anonymity or symmetry.
[6] Gibbons (1992, p. 68) refers to the parties' discount rate as the time value of money as a dollar received at the beginning of one period and this can be put in the bank to earn interest.
[7] As discussed by Smith (1996), these costs or benefits can have an effect on the workers' bargaining power through changes in their relative time preferences.

a higher share of the 'pie'. In some papers (see e.g. Doiron, 1992, among others), these costs are interpreted as the strike costs in case the negotiating parties use strikes as a dispute resolution mechanism. Among others, higher inventories, more liquid assets and lower capital intensity positively are shown to be related to a firm's strike costs and hence its bargaining power. (see e.g. Doiron, 1992, and Clark, 1991 and 1993). For workers, these strike costs could be related to the availability of strike funds or the availability of temporary jobs elsewhere. Also, other family members' income could form an alternative in case of disagreement during wage negotiations and it is even the case that these members are more motivated to apply for more temporary employment in case of disagreement. The chance that the workers or other family members obtain other employment in case of a disagreement depends on the probability of obtaining this other employment. This probability is inversely related to the rate of unemployment in the economy. Therefore, a higher unemployment lowers the unions' bargaining power. Other factors, such as globalisation, are therefore also able to affect the unions' bargaining power as these might have an impact on the rate of unemployment.

An informal theory regarding the determinants of the unions' bargaining power is also given in the paper of Donald and Suen (1992). The authors argue that workers' bargaining power is related to the amount of support workers are prepared to give to a wage claim. One factor influencing this support is the union's leadership but it is difficult to find a statistical measure for this. Another factor is the workers' feeling about the fairness of the claim. If workers feel that the claim is unreasonable, they are less eager to support the wage claim. In other words, restricting wages is felt to be important in periods of unfavourable economic conditions as large wage increases are considered to be dangerous to economic activity in general and jobs in particular. One direct indicator of the economic condition is the level of unemployment. It is also in this context that increased globalisation can have an impact on the economic situation as e.g. higher import competition (export competition) can increase (decrease) unemployment and hence influence unions' bargaining power. As pointed out by Donald and Suen (1992), the impact of unemployment on unions' bargaining power is not about the reduction in alternative job prospects or about the decline in the demand for labour but is instead related to the *will* of workers to press for a wage claim.[8]

In a related context, future profits of firms confronted with increased globalisation will be affected. As a consequence, producers are more aggressive during wage negotiations and

[8] Donald and Suen (1992) argue that union density may be an indicator of the justness of union wage claims.

are less willing to share their rents in case their profits will be negatively affected. In case of increased import competition, we expect a negative link between import competition and the unions' bargaining power. In the case of export expansion, the opposite result holds: unions are more able to extract higher rents in those firms with a strong export performance as firms will be able to tolerate higher wage claims.

As one of the first, Rodrik (1997) has pointed out that increased globalisation has lowered the workers' bargaining power. More specifically, he argues that the more substitutable domestic workers are with foreign workers due to e.g. international trade, outsourcing and foreign direct investment (FDI), the lower the enterprise surplus ending up with workers. He also points out that as a consequence, unions have become weaker. For the US, Baldwin (2003) finds that between 1977 and 1997, the share of workers with median education who where represented by a trade union declined from 29 to 14 percent. For workers with above median education and with basic education, the decline has been from 19 to 13% and from 58 to 51% respectively. However, a slight increase from 18 to 19% has been observed for the better-educated workers. Baldwin finds that international trade has in general a very small impact on the decline in unionisation, except for the decline in unionisation for workers with less education. Rodrik (1997) also mentions that the link between globalisation and the nature of bargaining between workers and employers has received little attention in the academic literature. Indirect empirical evidence for weaker unions is given by the study of Slaughter (2001) who investigates the hypothesis that trade liberalisation has contributed to increased labour demand elasticities. Using sectoral-level data, his empirical results are mixed and show that mainly time effects determine changes in labour demand elasticities. However, a number of trade-related variables (such as outsourcing, net exports, etc.) are found to have the predicted effect on the labour demand elasticity of especially non-production workers.[9] As pointed out by Slaughter (2001) and Rodrik (1997), finding increased labour demand elasticities in the case of increased foreign competition could be consistent with a story of a shift from labour towards capital bargaining power over rent distribution in firms enjoying extra-normal profits.

Work more directly related to impact of increased globalisation on workers' bargaining power is the paper of Budd and Slaughter (2003). This paper focuses on Canada and investigates whether profits are shared across international borders. More specifically, Canadian wages are regressed on Canadian and US profits, both interacted with several

[9] Among others, other papers such as Krishna et al. (2001) for Chile, Bruno et al. (2002) for several OECD countries have also investigated this issue.

variables related to international linkages such as multinational ownership, union type and tariffs and transportation costs. The empirical results regarding the profits of Canadian firms reveal that rent-sharing is weaker when the Canadian firm is part of a US multinational and/or international union. Budd and Slaughter argue that the standard profit-sharing situation is tempered because of additional complexities of multinational ownership and that US parents might feel competitive pressure when Canadian industry profits are high and hence try to restrain wages. When the Canadian profits are interacted with Canadian tariffs on US imports and transportation costs, the results reveal that higher Canadian profits are related to higher wages but there is no variation in rent-sharing across tariff levels and transport costs. Although less relevant for the discussion of this paper, the results regarding the US profit levels show that higher US profits increase or have no effect on the wages of workers of firms of US owned multinationals and/or employees part of an international union. Furthermore, higher US profits in low-tariff Canadian industries lower Canadian wages but this negative profit effect is moderated when Canadian tariffs are higher. Furthermore, these authors do not find any effect for the transport costs.[10]

In this paper, we further investigate the issue whether globalisation changes the unions' bargaining power as first pointed out by Rodrik (1997). We use a broad range of globalisation measures such as trade, outsourcing, tariffs and measures related to foreign direct investment. While this is the focus of this paper, we also pay some attention to the second mechanism of how international trade can affect wages in a union bargaining framework. More specifically, we also provide some evidence whether Belgian manufacturing wages are affected by international trade through changes in the firms' profits per worker. In the next section, we proceed with the stage-one regressions where we estimate the workers' relative bargaining power parameters. Subsequently, we relate these parameters to several globalisation measures.

3. STAGE-ONE REGRESSIONS: ESTIMATING WORKERS' (RELATIVE) BARGAINING POWER

To identify the effect of international trade on the workers' bargaining power, our estimation strategy consists of two stages. In the first stage, we estimate the workers' relative

[10] In a related paper, Budd, Konings and Slaughter (2002) investigate whether affiliate wages are affected by affiliate and parent profitability. Their results reveal that affiliate wages respond to parent profits per worker.

bargaining power ϕ for 15 sectors in the Belgian manufacturing industry over the period 1987-1995. In the second stage, we regress the estimated workers' relative bargaining power coefficients on several measures of trade, technology and many control variables. These stage-two regressions try to identify the factors that explain the workers' relative bargaining power.

3.1. Specification and data description

The econometric specification that acts as the basis for the stage-one regressions is derived from expression (4) and is given by:

$$\ln w_{ijt} = \alpha_0 + \delta_1 \ln w^0_{jt} + \delta_2 \ln U_{jt} + \phi \ln\left(\frac{\pi}{N}\right)_{ijt} + \alpha_i + \alpha_t + \varepsilon_{ijt} \qquad (5)$$

with $\phi = \frac{\beta}{1-\beta}$ as the workers' relative bargaining power and where index ijt stands for firm i in sector j at time t. To estimate equation (5), we use an unbalanced panel of the entire population of Belgian firms in the manufacturing industry over the period 1987-1995. All variables are taken from annual company accounts which are collected by the National Bank of Belgium (NBB). The dependent variable is the natural logarithm of the average real annual wage in firm i. The workers' outside option (w_a in equation (3)) is proxied by the sector-average real annual wage per worker (w^0_{jt}) and the sectoral unemployment rate (U_{jt}). To capture the firm's financial conditions, we use accounting profits, which are taken directly from the company accounts database. In the analysis, we exclude loss-making firms. All annual wages are expressed as real wages, i.e. nominal wages divided by the consumer price index with 1990 as reference year. Consumer price indexes were drawn from the Belgostat source of the NBB.[11] Average profits are also expressed in real terms, i.e. nominal profits divided by the producer price index. The producer price index is obtained from the Ministry of Economic Affairs.[12] Average wages and profits are constructed by dividing annual labour costs and profits by the average number of employees in each firm for each year respectively. ε_{ijt} represents a white noise error term. We also include time dummies to capture possible unobservable aggregate shocks common to all firms in a given year (α_t). By taking the first (logarithmic) difference of equation (4), we control for individual firm effects (α_i). As a

[11] These data can be downloaded from http://www.nbb.be/belgostat/.
[12] These data can be downloaded from http://ecodata.mineco.fgov.be.

consequence, our parameter estimates are consistent even if α_i were correlated with regressors. Table 1 includes some summary statistics of the key explanatory variables for the period 1987-1995.

<Insert Table 1 about here>

3.2. Estimation Strategy

Four Approaches to Balancing Time-series and Cross-section Pooling

To exploit fully the data's panel aspect, we report results of equation (5) for four different approaches to balancing cross-sectional and time-series pooling. The first approach pools all 15 sectors over all the years. This yields one manufacturing-wide rent-sharing parameter ϕ over the period 1987-1995. The second approach pools all the 15 sectors in each year, hence, stressing the time-series dimension. This yields annual manufacturing-wide rent-sharing parameters but it restricts all sectors to share the same rent-sharing parameter. To allow some variation within manufacturing, the third and the fourth approach provide estimates of ϕ for each sector separately. The third approach gives sector-specific rent-sharing parameters for the whole period, hence, focusing on the cross-section dimension. The fourth approach allows the rent-sharing parameter to vary over time and over sector, i.e. β is estimated for each sector separately year by year. These latter estimates will be used in the second-stage regression when we try to explain the determinants of the workers' relative bargaining power.

Econometric Problems

Ordinary least squares estimates of equation (5) will be biased for basically two reasons. First, our dependent variable, the wages per worker, is negatively related to the profits per worker by construction. Second, the estimates of β will be biased if rents per worker were measured with error. Measurement error can be present since both our wage and profit variable are divided by employment (Van Reenen, 1996, among others for a discussion). In other words, performing an OLS regression on equation (5) would lead to an endogeneity bias. Therefore, we try to find appropriate instruments for our empirical analysis.

Instrumentation Strategy

The econometric problems described above show that instrumentation is a necessary strategy to obtain consistent estimates of the rent-sharing parameter. Valid instruments must reflect changes in product market conditions inducing movements in rents per worker but they must be uncorrelated with the error term in the wage equation.

Our instrumentation strategy consists of two steps. In a first step, we use lagged levels of profits as instruments to estimate the rent-sharing parameters for the four approaches described above. For sake of comparison, we also report the OLS results. Our second step aims at introducing one of the channels through which international trade affects bargained wages, i.e. through movements in rents. More specifically, we use instruments that represent exogenous demand shocks that enter the wage equation only through the profits per worker variable. First, inspired by Abowd and Lemieux (1993) for Canada and Abowd and Allain (1996) and Kramarz (2003) for France, we use the prices of imports and exports in the industry as a source of exogenous variation in the firm's product market conditions. The fact that Belgium is a small open economy justifies treating changes in international prices as exogenous demand shocks since international prices are determined on the world market and are hence out of reach for Belgian firms. More specifically, we construct unit value indices for Belgian imports and exports based on the OECD International Trade by Commodities database.[13] Following Kramarz (2003) but in contrast to Abowd and Lemieux (1993), we use prices expressed in US dollars as exchange rates reflect, to some extent, exogenous changes. Moreover, the effect of exchange rates on the Belgian economy is difficult to determine and hence we avoided converting the international prices in terms of Belgian francs. The reason is that exchange rates fluctuate quite a lot and their effect on the real economy is difficult to determine.

Second, in line with Bertrand (1999) and Budd and Slaughter (2003), sector-specific exchange rates are also used as valid instruments. The reason we also use these variables as instruments is because in case there is imperfect competition in certain sectors, using export and import prices could no longer be a valid strategy (see also Revenga, 1992, for a discussion). Following Kramarz (2003), we could however have used US export prices since these variables might be exogenous to the Belgian economy. However, we were not able to do this because of data limitations, as there are no reliable data available for our period under

[13] The base year is 1990. Using this database to construct unit values as a proxy for import and export prices is frequently done in the literature (see e.g. Brenton and Pinna, 2000, among others).

study in the OECD Trade by Commodities database.[14] Moreover, only using US export prices makes it difficult to distinguish between the impact of import versus export competition on the firms' rents. Following Budd and Slaughter (2003), we computed trade-weighted multilateral Belgian exchange rates for each sector and each year where we also weigh bilateral exchange rates with import shares.[15]

Since the international prices and the exchange rates are defined at the sectoral level, they cannot be used as instruments when estimating sector-specific rent-sharing parameters, as there is no cross-sectional variation in that case. Therefore, we only report the results at the most aggregated level, i.e. pooled over sectors and over years. Using the export and the import prices at the one hand and the sector-specific exchange rates at the other hand as instruments in our regression equations, also serves as a consistency check for our estimations where we use the lags of the profit variables as instruments.

3.3. Empirical Results

In this section, the empirical results of the four approaches are reported.

First Approach: Pooling over Sectors and over Years

In this section, we provide manufacturing-wide estimates of the rent-sharing parameter over the period 1991-1995. The first part of Table 2 presents the Ordinary Least Squares estimate of equation (5). Controlling for year-, sector- and firm-level effects, the estimated wages-profits elasticity amount to 0.09 and is strongly significant. This point estimate is somewhat higher than the one of Goos and Konings (2001) who find an elasticity of 0.06. This point estimate also clearly shows that symmetric Nash bargaining, in case we would have a coefficient of the relative bargaining power equal to one, could easily be rejected.

<Insert Table 2 about here>

However, as discussed above, OLS estimates are likely to be affected by endogeneity biases. Therefore, we test the endogeneity of profits per worker in two ways. First, we use the

[14] Kramarz (2003) however uses the same OECD dataset but uses a different time period.
[15] We only took the trade flows of those countries for which their share in the Belgian imports exceeds 2 percent.

Durbin-Wu-Hausman test. From Table 2, this test indicates that the OLS specification is rejected. Second, as suggested by Davidson and MacKinnon (1993), we perform an augmented regression test. More specifically, we regress the endogenous variable (profits per worker) on the set of instruments and the exogenous variables in the wage equation. We recuperate the residual of this regression and augment the wage equation with this residual. The exogeneity test amounts to testing whether the coefficient of the residual equals zero in the wage equation. In line with the Durbin-Hausman-Wu test, this augmented regression test indicates that OLS is not consistent.[16]

In the second column of Table 2, we use the 2-period and the 4-period lagged value of profits per worker as instruments. The exogeneity of the instruments with respect to the error term is tested by the Hansen-Sargan test statistic, which is distributed as chi-squared. The specification test does not show evidence against our estimates: the Hausman-Sargan test does not reject the null hypothesis that our instruments are valid. Taking into account endogeneity, we find a wages-profit elasticity of 0.06. From the OLS as well as the TSLS estimates, outside forces do not seem to play an important role in the wage determination process.

To check the robustness of the results, we now present the two consistency checks, which also capture the effect of international trade on bargained wages through shifts in the size of the rents.

The third column of Table 2 reports the results of equation (4) using the exchange rates from period t until period $(t-5)$ as instruments. The point estimate of the average manufacturing-wide wages-profits elasticity is 0.09. Again, we cannot reject the null hypothesis that the overidentifying restrictions are correct.

The fourth column of Table 2 reports the estimate of the rent-sharing parameter using international prices as instruments. Before discussing the results, we first test whether these foreign competition shocks present pure demand shocks. We follow Abowd and Lemieux (1993) and Kramarz (2003) and compare least squares estimates of supply equations (quantities as a function of prices) to instrumental variables estimates of the same supply equation in which the output price is instrumented with the price of imports and the price of exports. Least squares estimates of the elasticity of supply with respect to the output price could be either negative or positive, depending on the variance of demand and supply shocks and on demand and supply elasticities (see Abowd and Lemieux, 1993). Once these output prices are instrumented using international prices, however, the elasticity should become

[16] Results not reported but available upon request.

positive if international prices are exogenous demand shocks that trace down the supply curve. In the first column of Table 3, we estimate the relation between firm-level real sales and sector-level value-added prices, sector-level wages and a time trend in the cross-section dimension. In the second column, we control for firm-level fixed effects. In the third column, we instrument value-added prices using 4-period lagged import and export prices. The estimated supply elasticity using the OLS and the fixed-effects estimation methods is statistically significant, reflecting that supply shocks dominate demand shocks. On the other hand, the IV estimates point to positive and significant supply elasticity. The elasticity is equal to 0.543, which is slightly above the one estimated by Abowd and Lemieux and very well in line with the one estimated by Kramarz (2003). The Hansen-Sargan test does not reject the joint validity of the instruments. Our findings are hence consistent with the fact that international prices represent exogenous demand shocks that increase product market competition in Belgium.

<Insert Table 3 about here>

Before turning to the IV estimates of the rent-sharing parameter using international prices as instruments, we present the reduced-form equations for bargained wages and profits per worker in Table 4. All the estimated specifications are in first-differences and all variables are expressed as natural logarithms. They all include the price of imports and exports, the sector-average wage and the sector unemployment rate as explanatory variables. The specifications in columns (1) and (3) also include a time trend. As expected, the price of exports has a positive and statistically significant effect on real wages per worker and real profits per worker in all specifications. This means that increased foreign competition in the form of lower export prices reduces both wages and profits per worker. The estimated effect on rents per worker is larger than the estimated effect on wages per worker, implying that workers do not capture all the rents created by changes in the price of exports. A rather unexpected result is that the price of imports affects both wages and profits per worker significantly negatively.

<Insert Table 4 about here>

From the last column of Table 3, it follows that the estimated wages-profits elasticity is considerably higher using international prices as instruments than the ones using lagged profit values and exchange rates as instruments. The point estimate is about 0.17.

Second Approach: Pooling over Sectors per Year

Table 5 reports manufacturing-wide rent-sharing parameters for the years 1991 until 1995. We present both the OLS and the TSLS estimates using lagged values of profits per worker as instruments. For all years, the Hansen-Sargan Test does not reject the joint validity of the instruments. For the years 1991, 1992 and 1993, the TSLS estimate is considerable larger than the OLS estimate while the opposite is true for the years 1994 and 1995. Focusing on the TSLS estimates, we can conclude that the manufacturing-wide wages-profits elasticity is highly stable over time and amounts to 0.12 on average.

<Insert Table 5 about here>

Third Approach: Pooling over Years per Sector

So far, we restricted all sectors to share the same rent-sharing parameter. To address the important issue of heterogeneity in workers' bargaining power across sectors, we now split up the manufacturing industry into 15 sectors. An overview of the different sectors is given in Table A.1 of Appendix A. The sectoral classification is based on the availability of the sectoral classification of the variables used in the second stage and the availability of the number of firms within each of these sectors. Table 6 reports rent-sharing estimates for each of the 15 sectors over the whole period. As the Durbin-Wu-Hausman test does not reject the OLS estimates in favour of the TSLS estimates, we only report the OLS estimates in Table 6. All estimated wages-profits elasticities are highly significant and range from 0.04 (sector 5 which stands for the printing and allied industries) to 0.268 (sector 14 representing the industry of other transport equipment). The results point to considerable variation in rent-sharing behaviour within the manufacturing sector. Moreover, we performed F-tests to investigate whether the rent-sharing parameters differ according industries. The results reject the poolability across the different sectors.

<Insert Table 6 about here>

Fourth Approach: Per Sector, per Year

In the fourth approach, we allow the workers' bargaining power to vary over time and over sector. In Table 7, we present both the OLS and the TSLS estimates for each sector separately year by year. Focusing on the OLS estimates, we find that 85% of the estimated wages-profits elasticities are statistically significant at the 1% level. As far as the TSLS estimates are concerned, the results show that 65% of the estimates are statistically significant at the 1% level, 8% at the 5% level and 24% are not significant. For almost all specifications, we find that the TSLS estimates exceed the OLS estimates. It is also clear that the wages-profits elasticities vary considerably over time and over sector. For 10 out of the 15 sectors, our results show that the estimated rent-sharing parameter is higher in 1995 compared to 1991. Focusing on the TSLS estimates, the mean of the estimated wages-profits elasticities amounts to 0.114 and the standard deviation to 0.055. All sector-specific elasticities vary between 0.014 and 0.092.

<Insert Table 7 about here>

4. THE STAGE-TWO REGRESSIONS: THE DETERMINANTS OF THE WORKERS' RELATIVE BARGAINING POWER

4.1 Specification and data description

The empirical methodology for the stage-two regressions borrows from Slaughter (2001) who investigates the impact of international trade on labour demand elasticities following a two-stage approach. As pointed out by Svejnar (1986), no literature exists on an appropriate function form of the determinants of the workers' relative bargaining power. In other words, we could not estimate one or more structural equations based on a general equilibrium model. Therefore, we estimate a reduced-form equation of the estimated relative workers' bargaining power ϕ of the first stage on several explanatory variables derived from an implicit structural model. More specifically, we use the following reduced-form regression:

$$\phi = \frac{\beta_{jt}}{1-\beta_{jt}} = \alpha + \sum_k b_k X_{jk} + \sum_j \chi_j (ID_j) + \sum_t (TD_t) + u_{jt} \qquad (6)$$

With ϕ_{jt} the estimated relative workers' bargaining power obtained from the first stage regressions with the subscript j denoting industry and the subscript t denoting time. X_{jk} refers to a specific explanatory variable with K the total number of explanatory variables, ID_j denoting an industry specific dummy for industry j, TD_t referring to a time dummy for period t and u_{jt} is the error term for the second stage regression equation (6). These industry and time dummies capture other variables explaining workers' relative bargaining power that are not included in the above stage-two regression equation. More specifically, industry dummies capture variables that are industry-specific and time invariant such as differences in job type and the type of product in a certain industry, differences in unions' utility functions as some unions might care relative more about employment than about wages, the firms' holdings of inventories, the capital utilisation rate, the union density, etc. (see e.g. McDonald and Suen, 1992, Smith, 1996, Doiron, 1992, and for a further discussion on these issues). The time dummies control for factors that are not industry specific but change workers' relative bargaining power over time such as e.g. the change in the consumer price index, the national unemployment rate, taxes, interest rates, etc (see e.g. Svejnar, 1986 and Doiron, 1992 for a discussion).

Table 8 provides summary statistics for our explanatory variables. These variables are constructed such that they match the first stage sectoral classification of the firth approach of the first-stage analysis. Table A.1 in Appendix A gives an overview of the sectoral classification used to determine the workers' relative bargaining power per sector each year. More specifically, we have five variables related to international trade, three variables related to foreign direct investment, three technology variables and three control variables. Some of these variables have been used in earlier studies of the determinants of workers' bargaining power (see e.g. Veugelers, 1989 and Svejnar, 1986), while other variables related to international trade and foreign direct have, except for the paper of Budd and Slaughter (2003), not been related to workers' bargaining power. As argued before, we further investigate this issue and introduce a richer specification such that we are able to further investigate whether globalisation has an effect on the unions' relative bargaining power. In what follows, we describe the explanatory variables

of equation (6) together with their expected effect on the workers' relative bargaining power parameter. This effect is also shown in the last column of Table 8.

< Insert Table 8 about here >

- *Trade variable 1*: the ratio of imports to production. We expect that the higher this measure in a certain sector, the lower the workers' bargaining will be because increased import competition leads to less favourable labour market conditions or firms' profit conditions such that workers might end up with a less smaller share of the rents.
- *Trade variable 2*: the ratio of exports to production. In the case of export expansion, the opposite result holds: unions are more able to extract higher rents in those sectors with a strong export performance.
- *Trade variable 3*: narrow outsourcing divided by production. Feenstra and Hanson (1999) refer to narrow outsourcing as outsourcing within the same industry as the importer. We expect this variable to have a negative effect on the workers' bargaining power. Like a lot of other OECD countries, the Belgian economy is confronted with quite a lot of outsourcing, mostly of standardised products. As pointed out by a survey of the Federal Planning Office (2000), lower labour costs in the host country are the main motive for outsourcing. A priori, we however expect that outsourcing is accompanied with less favourable labour market conditions for Belgian employees and hence lower their relative bargaining power as they see it necessary to restrain wages.
- *Trade variable 4*: broad outsourcing divided by production. In contrast to narrow outsourcing, this measure also includes intermediate imports coming from others sectors. The expected effect of this variable on the workers' bargaining power is the same as for the narrow outsourcing variable.
- *Trade variable 5* refers to tariffs. As discussed in Budd and Slaughter (2003), tariffs are able to shield domestic markets from foreign competition. More specifically, we expect a positive link between tariffs and the workers' relative bargaining power as they feel more eager to press for a higher share of the 'pie'.

- *Foreign direct investment variable 1*: the number of foreign owned firms relative to the total number of firms. In what follows, we experiment with several variables related to inward foreign direct investment.[17] Similar to Budd and Slaughter (2003), the expected effect on the workers' relative bargaining power is both positive and negative. At the one hand, there is evidence that foreign-owned companies pay higher wages than domestic firms. Aitken et al. (1996) show that in Mexico, Venezuela and the United States, higher foreign direct investment levels are associated with higher wages. Girma, Greenaway and Wakelin (2001). Fabbri, Haskel and Slaughter (2002) also find that UK multinationals pay higher wages than domestically owned firms. However, these papers do not whether investigate whether rent-sharing is dependent on the firm's ownership structure. An exception is the paper of Budd and Slaughter (2003) who investigate whether rent-sharing is higher in multinational firms. Their empirical results reveal that this is not the case. As an explanation, they argue that this result stems from additional complexities of multinational ownership and that parent companies might feel competitive pressure when Canadian industry profits are high and hence try to restrain wages. In other words, labour costs consideration might play an important role such that firms are more aggressive during wage negotiations since they want to resist to wage increases.

  We also think that there is an alternative explanation given by the footloose nature of multinationals firms as multinationals can shift their entire or part of their production to another country in case the present circumstances are unfavourable (Caves, 1996). The footloose nature of multinational companies is documented by Gorg and Strobl (2003) who find that, after controlling for plant and industry-specific characteristics, Irish multinational companies are more likely to shut down operations in comparison to domestic firms. For the US, Bernard and Jensen (2002) provide empirical evidence that plants owned by US multinationals are more likely to close down than plants of non-multinationals. Fabri et al. (2002) find that multinational plants, both UK and foreign-owned, are more likely to close down in comparison than domestic plants, conditional on variables such as related to operational advantage making these multinationals less likely to shut down such as

[17] Because of data availability, we are not able to test for the effect of outward foreign direct investment on the workers' relative bargaining power. As pointed out by Slaughter (2001), this measure can be used as an alternative proxy for outsourcing.

being older and larger. The empirical evidence of the footloose nature of foreign-owned firms is therefore able to create a general atmosphere of uncertainty in which workers are less likely to press for higher wages in the form of obtaining a part of the firms' profits. Schreve and Slaughter (2002) investigate whether foreign direct investment has an effect on the workers' feeling of insecurity. At the one hand, multinational presence is able to increase the workers' economic insecurity by raising the volatility of wages and employment. At the other hand, Schreve and Slaughter argue that an explanation for the higher wages in foreign-owned firms could be consistent with a with a story where workers get compensated more because they are facing a higher risk of plant shut down. Therefore, the ex ante expectation regarding the impact of foreign direct investment on worker insecurity is unclear. When the authors test their hypothesis, foreign direct investment increases the workers' perception of economic insecurity measured as a person's stress/ anxiety about one's economic misfortune.

While direct evidence for the footloose nature of multinationals in the Belgian economy is lacking, De Backere and Sleuwaegen (2003) find that inward foreign direct investment discourages entry and stimulates exit of Belgian domestic entrepreneurs. However, this crowding out effect might be moderated or even reversed in the long term because of learning, demonstration, networking and linkage effects between foreign and domestic firms. Therefore, these results might add to the workers' feeling of insecurity and hence influence their bargaining power. Whether the effect of inward foreign direct investment on the bargaining power of workers of incumbent firms is positive or negative remains however an empirical issue.

- *Foreign direct investment variable 2 (and 3)* refers to the employment (value added) of foreign-owned firms relative to the total employment (value added). The expected effect on the workers' bargaining power is the same as that for foreign direct investment variable 1.
- *Technology variable 1*: Research and Development (RD) divided by production. Subsequently, we experiment with several technology variables. It is often argued that technological change, instead of international trade, lies at the basis of changes in the labour market (see e.g. Berman et al., 1994, and Krugman and Lawrence, 1996). As a first technology measure, research and development divided by production is a measure for innovative input. A priori, we expect the effect of technological change

on the workers' bargaining power to be positive or negative. As discussed in Betcherman (1991), technological change can effect the distribution of the 'pie' between employers and employees. The core of their story is that technological change can affect the nature of the production process.[18] First, Betcherman (1991) argues that workers will have higher bargaining power in case labour costs do not constitute a large part of the firm's total costs. The reason is that the less important labour costs are, the less an increase in the price of labour will cause an increase in the product price and hence negatively affect the firm's product demand. Betcherman (1991) points out that the impact of technological change on the importance of labour costs is a priori unclear and depends on the bias of technological change.

Second, Betcherman (1991) points out that the workers' essentiality in terms of their indispensability in the production process, is another channel explaining the impact of technological change on the workers' bargaining power. When employees are essential to production, they have strong bargaining power during wage negotiations. The workers being essential in the production process depend on how critical their skills are, their knowledge and resources and how costly a strike would be for the firm. Technological change can change the workers' essentiality. Again, the effect is not clear. At the one hand, technological change can be labour-augmenting in the sense that the introduction of new production processes and technologies go hand in hand with the use of more labour. At the other hand, technological change can also be labour-saving when investment in new technology leads to lower use of labour. This last mechanism could be very important in Europe in general and Belgium in particular where high labour costs prevail (Abraham and Verret, 1996). The empirical results of Betcherman (1991)[19] reveal that the workers' bargaining power for blue-collar workers is lower in firms, which introduced process computerisation. For skilled workers the workers' bargaining power is also lower but

[18] These authors however use union/ non-union wage differentials as a proxy for workers' bargaining power. Moreover, they use a story of change in labour demand elasticities to explain the effect on the workers' bargaining power.

[19] As often done in the literature, the workers' bargaining power is measured as the union/ non-union wage differential. In contrast to their analysis, we are not able to make a distinction between blue- and white collar workers.

general manual occupations have a higher bargaining power in case of process computerisation.

- *Technology variable 2*: patents divided by production. This measure is related to innovative output. The expected effect of this variable on the workers' relative bargaining power is the same as technology variable 1.
- *Technology variable 3*: the percentage change in Total Factor Productivity (TFP). TFP measures the gains that raise the productivity of all production factors. We assume that higher TFP growth is associated with technological change and therefore expect the same effect on the workers' relative bargaining power like for technology variables 1 and 2.
- *Control variable 1*: the unemployment rate. This variable has also been used by other authors investigating the determinants of workers' bargaining power (see among others, Veugelers, 1987, and Svejnar, 1986, Donald and Suen, 1992). As already discussed in Section 2.2 of this paper, we expect a negative coefficient for this variable.
- *Control variable 2*: the C5-concentration ratio and represents the sales of the top 5 firms divided by the total sales. A higher C5-concentration ratio is consistent with less fierce product market competition. As discussed in Veugelers (1987), higher output market concentration is able to increase the management's ability to raise prices above marginal costs and therefore producers are less sensitive to wage increase since they can shift cost increases – e.g. higher wage costs – to consumers. In other words, a higher C5-concentration ratio is expected to have a positive impact on the workers' bargaining power. However, this author also argues that more market power in the product market could also be transferred to power positions in the input market such that the workers' bargaining power is eroded. Therefore, the expected coefficient of the C5-concentration ratio is positive or negative depending on which of these two mechanisms prevail.
- *Control variable 3*: the capacity utilisation ratio. This variable represents the general state of the economy. A higher capacity utilisation ratio reflects a better economic situation and hence should allow the unions to press for higher wages. We therefore expect a positive coefficient for this variable.

4.2 Estimation strategy

As indicated earlier, our estimation strategy closely follows the empirical methodology of Slaughter (2001) who investigates the effect on international trade on labour demand elasticities. While other authors investigating the determinants of the union's (relative) bargaining power have estimated one single equation (see Doiron, 1992, Svejnar, 1986, and Veugelers, 1987, among others), we preferred to estimate equation (6) where we use each of the 14 explanatory variables separately. The reason is, as already pointed out before, that there is no formal theory explaining the workers' relative bargaining power. In what follows, we discuss three important issues regarding our estimation strategy and closely follow the work of Slaughter (2001).

A first issue has to do with the exogeneity of the regressors. Variables related to outsourcing and technology are endogenously determined input variables. As documented in other work (see e.g. Abowd and Lemieux, 1993), import and export quantities are – in contrast to export and import prices in a small open economy – not fully exogenous since these depend on domestic demand and supply conditions. Regarding the trade variables, we expect our tariff measure to be the most exogenous variable (see also Haskel and Slaughter, 2002, for a discussion). As a consistency check, we used lags of the trade and technology variables instead of their contemporaneous values.[20] The results indicate that when using the fixed effects and the fixed effects together with the time dummies, some variables are no longer statistically significant.

A second issue is related to the fact that the dependent variable from equation (6) is estimated in the first stage. Therefore, the error term in this equation is heteroskedastic with zero mean and variance equal to the variance of the error term of the first stage regression plus the variance of the estimated relative workers' bargaining power ϕ. Following Slaughter and Anderson (1993), we also correct for this form of heteroskedasticity by weighing less heavily those observations for which the variance of the relative bargaining power is higher. More specifically, we perform an Ordinary Least Squares (OLS) regression on equation (6) from which we take the squared residuals. Subsequently, we regress these squared residuals on the variance of the

[20] It was not possible to use the lags of the outsourcing variables as we don't have enough observations through time.

relative bargaining power coefficients, together with these variances squared and cubed. Finally, we use the inverse of the predicted values of this regression as weights in a weighted least squares of equation (6).

A last issue is related to the fact that, as already pointed out before, that there is no real theoretical model predicting which variables to use in a regression equation explaining the workers' relative bargaining power. As a robustness check, we estimate equation (6) using several combinations of the independent variables. More specifically, we combine one trade variable or one foreign direct investment variable with one technology variable and one control variable. In general, our results are fairly robust when using these different combinations.[21] Moreover, we also experimented with several combinations of the industry and time dummies and tried four different combinations like in Slaughter (2001) who uses regressions with no controls, only industry dummies, only time dummies and a combination of both.

4.3 Empirical results

Table 9 reports the regression results of equation (6), using each time one single independent variable. In general, the regression results of this table reveal that, except for the control variables, the expected signs of the regression coefficients are obtained. However, in a number of cases, these regression coefficients are not always statistically significant as their significance depends on the inclusion of the industry and time fixed effects.

< Insert Table 9 here >

Regarding the international trade variables, we find some evidence that international trade has an impact on the unions' relative bargaining power. In our estimations with no controls, the export/production and the tariff variables, have t-values of at least one and this last variable is even significant at the 1% level. Higher exports in a sector induce workers to capture a higher share of the rents. In sectors where higher tariffs apply and hence are more shielded from international competition,

[21] The results are available from the authors upon request.

workers are able to capture a higher share of the 'pie'. The sign of the regression coefficient of the imports/production has the expected sign but is not statistically significant.

For the regressions with only the industry fixed effects, the import/production variable has now a statistically significant regression coefficient meaning that in those sectors with higher import competition the share of rents going to workers is squeezed. The variable for the import tariffs remains statistically significant and has the expected sign. If industry-fixed effects are used, we are in fact focussing on the intra-sectoral rather than on the inter-sectoral variation of the variables.[22] In other words, the focus is on how the workers' relative bargaining power moves over time within each sector rather than on how the relative bargaining power moves over the different sectors.

When all controls are introduced, both the tariffs and the import variable stay statistically significant and have the correct sign. Moreover, it is also the case that our export variable becomes statistically significant meaning that workers are able to push for higher wages in case their firms are exporting a lot.

In the regressions with only the time fixed effects, all trade variables loose their statistical significance. One explanation is that there is not much intersectoral variation over time of the independent variables such that the time-fixed effects pick up a lot of the variation in the relative bargaining power parameters. Following Slaughter (2001), who also obtains this empirical result in his paper on the determinants of the labour demand elasticities, we checked by using plots by each sector of each independent variable against time to see whether these trade variables possess enough intersectoral variation over time. Inspection of the data shows that the import/production variable has increased in nearly all sectors, while the export/production variable has for most sectors remained rather stable. In order to test further whether our relative bargaining power parameters are driven by time, we introduced a time trend in our regressions but did not find a statistically significant effect for this variable. This result is also consistent with our finding of Section 3, which presented not much time variation in our estimations of the rent-sharing parameter. Table 9 also reveals that our outsourcing variables were never statistically significant.

[22] The fixed effects estimator is therefore also called the within-estimator in panel data models.

Regarding the inward foreign direct investment variables, our results showed that workers have lower relative bargaining power in those sectors with a lot of foreign-owned firms relative to the total number of firms. Before, we have introduced several explanations for this result. First, Budd and Slaughter (2003) have pointed out that this result could be consistent with the complex nature of multinational firms in the sense that parent companies might feel competitive pressure when affiliate profits are high and hence try to restrain wages. Second, the footloose nature of firms induces workers induces workers to bargain for lower wages. Third, workers of incumbent firms could also feel less secure as inward foreign direct investment might crowd out domestic entrepreneurship and hence create a less favourable bargaining environment.

Strong statistically significant results emerge from our technology variables, especially for our variable of innovative input (R&D divided by output). In those industries with more technological change, workers are more willing to press for higher wages as these workers might be essential in production and/or labour costs become less important because of technological change. Statistically significant positive effects are also obtained for the TFP-variable but the regressions coefficients of the variable for innovative output, patents divided by production, are negative.

We don't obtain the expected sign for the regression coefficients of our control variables. The regression coefficient for the unemployment (capacity utilization) variable shows in some cases a negative (positive) statistically significant sign. This positive coefficient for the unemployment variable is consistent with the empirical results of other empirical work for Belgium (see e.g. Abraham and De Bruyne, 2000) who find that higher unemployment has not led to wage moderation.[23]

5. CONCLUSION

In this paper, we have investigated whether international trade has affected workers' wages for the Belgian manufacturing industry by using a rent-sharing framework. In the first part of our analysis, we have studied whether international trade affects wages through changes in the firms' rents. Similar to other papers considering rent-sharing in the Belgian economy, we find a positive relation between workers' wages and the firms' profits. Moreover, our regression revealed that increased foreign competition in the form of lower

[23] This finding is consistent with results of other European studies finding a weak effect of unemployment on wages (see e.g. Layard et al., 1991, and Eichengreen, 1993).

export prices reduces both wages and profits per worker. The estimated effect on rents per worker is larger than the estimated effect on wages per worker, implying that workers do not capture all the rents created by changes in the price of exports. A rather unexpected result was that the price of imports affects both wages and profits per worker significantly negatively.

In the second part of our paper, we have studied whether globalisation has affected workers' bargaining power. As one of the first, Rodrik (1997) has pointed out that increased globalisation has eroded workers' bargaining power. Budd and Slaughter (2003) have further investigated this issue and have found that the effect of domestic profits on the workers' wages depends on variables related to foreign direct investment and tariffs. We have further explored the link between globalisation and the relative bargaining power by also introducing measures related to import and export competition, outsourcing, tariffs and foreign direct investment. Although technological change seems to have an important effect on the workers' relative bargaining power, we have found that globalisation also matters. More specifically, import and export competition and the tariffs seemed to have the expected effect on the workers' bargaining power for some of our regression specifications. Regarding inward foreign direct investment, we have found that more foreign-owned firms in a sector reduced the workers' bargaining power. This result is consistent with the results of Budd and Slaughter (2003). We have put forward several explanations such as the footloose nature of multinational companies and the crowding out of domestic entrepreneurship.

This work leaves open several paths for future research. First, we considered the case of a typical European unionised country. Although rent-sharing is not only present in unionised countries (see Nickell, 1999, for a discussion), it could be interesting to see whether increased globalisation has effected workers' bargaining power in a non-unionised country such as the US. As documented by Baldwin (2003), unions have become less important in the US during the last decennia. Second, we did not distinguish between skilled and unskilled workers. As widely documented in the trade-wages literature, international trade and technological change have a different impact on skilled versus unskilled workers. A follow-up paper is forthcoming addressing these issues and investigating the impact of globalisation on workers' bargaining power for the US.

Table 1 Stage-one Regression: Summary Statistics

Variables	**1987-1995**		
	# Obs.	**Mean (x 100 000 BEF)**	**Sd.**
Firm-average Real Wage per Worker	109 208	9.859	6.952
Firm-average Real Profits per Worker	108 153	4.242	20.247
Sector Unemployment Rate (%)	122 174	15.345	6.012
Sector-average Real Wage per Worker	123 421	8.722	0.963

Source: National Bank of Belgium (NBB).

Table 2 Wage Equation 1991-1995, First Approach: Pooling over Sectors and over Years.

***ESTIMATION* METHOD**	**OLS**	**TSLS[a]**	***TSLSb***	**TSLS[c]**
Constant	0.031*** (0.003)	0.036*** (0.006)	0.026*** (0.005)	0.023*** (0.006)
Profits per Worker	0.095*** (0.005)	0.063* (0.036)	0.090* (0.051)	0.171* (0.092)
Sectoral Unempl.	-0.015 (0.018)	0.007 (0.035)	-0.016 (0.021)	-0.009 (0.023)
Sectoral av. Wage	0.159 (0.118)	0.080 (0.161)	0.159 (0.120)	0.153 (0.118)
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Durbin-Wu-Hausman Test (p-value)	0.0025			
Hansen-Sargan IV Test p-value		0.154	0.290	0.079
Obs.	73 361	26 025	73 351	73 351
R^2	0.077	0.112	0.077	0.035

***Significant at 1%; **Significant at 5%; *Significant at 10%. Robust standard errors in parentheses.

The dependent variable is the firm-average real wage per worker. All variables are expressed as natural logarithms and are first-differenced. The instruments are in levels. Durbin-Wu-Hausman Test: test of endogeneity of real profits per worker.

Hansen-Sargan Instrument Validity Test: tests of correlation among instruments and residuals, asymptotically distributed as χ^2_{df}.

a: instruments: profits per worker $_{t-2}$, profits per worker $_{t-4}$.

b: instruments: exchange rates $_{t, t-1, t-2, t-3, t-4, t-5}$.

c: instruments: export prices $_{t}$, import prices $_{t}$.

Table 3 Supply Equation, 1987-1995.

***ESTIMATION* METHOD**	**OLS**	**Firm Fixed Effects**	**TSLS[a]**
Constant	19.386*** (6.481)	-48.951*** (1.705)	19.483*** (1.492)
Price of Value Added	-0.571*** (0.103)	-0.126*** (0.028)	0.543*** (0.205)
Sectoral av. Wage	2.775*** (0.075)	0.200* (0.120)	0.351** (0.164)
Time Trend	-0.010*** (0.003)	0.027*** (0.001)	-0.010*** (0.001)
Obs.	71 594	71 594	45 390
R^2	0.022	0.026	.
Hansen-Sargan IV Test p-value	0.022	0.026	0.103

***Significant at 1%; **Significant at 5%; *Significant at 10%. Robust standard errors in parentheses.
The dependent variable is firm-level real sales. The prices and wages are measured at the industry level. All variables and instruments are expressed as natural logarithms. The price of value added and the wage are deflated by the CPI (1990=100), while sales are deflated by the producer price.
A full stop in the R^2 box indicates that the calculated R^2 was negative and hence is not reported.
a: instruments: import prices $_{t-4}$, export prices $_{t-4}$.

Table 4 OLS Estimates of the Reduced Forms for Wages and Profits per Worker, 1987-1995.

DEPENDENT VARIABLE	**Firm-average Real Wage per Worker**		**Firm-average Real Profits per Worker**	
Constant	12.747*** (1.404)	0.007*** (0.002)	-0.763 (4.056)	-0.049*** (0.004)
Sectoral Unempl.	-0.039*** (0.013)	-0.043*** (0.015)	-0.125*** (0.040)	-0.122*** (0.037)
Sectoral av. Wage	0.123 (0.128)	0.118 (0.128)	-0.054 (0.370)	-0.048* (0.368)
Import Price	-0.026*** (0.003)	-0.015*** (0.004)	-0.040*** (0.015)	-0.039*** (0.014)
Export Price	0.021*** (0.003)	0.019*** (0.004)	0.035*** (0.013)	0.034*** (0.012)
Time Trend	-0.006*** (0.001)		0.0004 (0.002)	
Obs.	73 351	73 351	73 383	73 383
R^2	0.003	0.002	0.0003	0.0003

***Significant at 1%; **Significant at 5%; *Significant at 10%. Robust standard errors in parentheses.
The dependent variables are firm-average real wage per worker and firm-average real profits per worker. All variables are expressed as natural logarithms and are first-differenced.

Table 5 Wage Equation, Second Approach: Pooling over Sectors, by Year.

Estimation Method	OLS	TSLS[a]
1991		
Profits per Worker	0.068*** (0.004)	0.120*** (0.007)
Hansen-Sargan IV Test p-value		0.674
Obs.	12 218	5 957
1992		
Profits per Worker	0.062*** (0.004)	0.124*** (0.009)
Hansen-Sargan IV Test p-value		0.872
Obs.	12 627	6 053
1993		
Profits per Worker	0.081*** (0.006)	0.131*** (0.009)
Hansen-Sargan IV Test p-value		0.182
Obs.	12 626	5 946
1994		
Profits per Worker	0.271*** (0.013)	0.102*** (0.014)
Hansen-Sargan IV Test p-value		0.806
Obs.	12 719	5 958
1995		
Profits per Worker	0.282*** (0.013)	0.133*** (0.014)
Hansen-Sargan IV Test p-value		0.245
Obs.	12 715	6 163

***Significant at 1%; **Significant at 5%; *Significant at 10%. Robust standard errors in parentheses.
The dependent variable is the firm-average real wage per worker. All variables are expressed as natural logarithms.
Hansen-Sargan Instrument Validity Test: tests of correlation among instruments and residuals, asymptotically distributed as χ^2_{df}.

a: instruments: profits per worker $_{t-3}$, profits per worker $_{t-4}$.

Table 6 Wage Equation, OLS Estimates, Third Approach: Pooling over Years, by Sector.

	Code NACE-70	Name	Wage-profits Elasticity
Sec 1	41+42	Food, beverages and tobacco	0.104*** (0.003)
Sec 2	43	Textiles	0.090*** (0.005)
Sec 3	44+45	Wearing apparel and leather and products	0.083*** (0.004)
Sec 4	46	Wood products and furniture and fixtures	0.059*** (0.004)
Sec 5	471+472	Manufacture of pulp, paper and board	0.039*** (0.009)
Sec 6	473+474	Printing and allied industries	0.050*** (0.004)
Sec 7	25+26	Chemical industry and man-made fibres	0.122*** (0.008)
Sec 8	48	Rubber and plastic products	0.060*** (0.006)
Sec 9	24	Non-metallic mineral products	0.086*** (0.005)
Sec 10	22	Basic metal industries	0.072*** (0.023)
Sec 11	31	Metal products	0.214** (0.011)
Sec 12	32	Non-electrical machinery	0.234*** (0.021)
Sec 13	33+34+37	Office and computing machinery, electrical machinery and professional goods	0.236*** (0.017)
Sec 14	35+36	Other transport equipment	0.268*** (0.027)
Sec 15	49	Other manufacturing	0.078*** (0.006)

***Significant at 1%; **Significant at 5%; *Significant at 10%. Robust standard errors in parentheses.
All variables are expressed as natural logarithms and are first-differenced.

Table 7 Wage Equation, Fourth Approach: Per Sector, by Year.

Sector	Year	Wage-profits elasticity (OLS)	Wage-profits elasticity (TSLS)
Sec1	**1991**	0.107*** (0.010)	0.151*** (0.018)
	1992	0.092*** (0.009)	0.154*** (0.020)
	1993	0.099*** (0.010)	0.131*** (0.018)
	1994	0.115*** (0.010)	0.148*** (0.016)
	1995	0.108*** (0.008)	0.182*** (0.016)
Sec2	**1991**	0.088*** (0.013)	0.128*** (0.020)
	1992	0.076*** (0.013)	0.118*** (0.023)
	1993	0.069*** (0.013)	0.136*** (0.025)
	1994	0.090*** (0.015)	0.119*** (0.027)
	1995	0.103*** (0.016)	0.145*** (0.030)
Sec3	**1991**	0.073*** (0.012)	0.118*** (0.023)
	1992	0.073*** (0.011)	0.115*** (0.022)
	1993	0.072*** (0.012)	0.109*** (0.025)
	1994	0.073*** (0.014)	0.116*** (0.024)
	1995	0.083*** (0.012)	0.111*** (0.026)
Sec4	**1991**	0.053*** (0.013)	0.081*** (0.021)
	1992	0.027*** (0.012)	0.125*** (0.022)
	1993	0.043*** (0.013)	0.112*** (0.023)
	1994	0.073*** (0.012)	0.103*** (0.023)
	1995	0.066*** (0.014)	0.076*** (0.021)
Sec5	**1991**	0.075*** (0.025)	0.035 (0.049)
	1992	0.076*** (0.027)	0.073 (0.056)
	1993	0.064** (0.034)	0.043 (0.031)
	1994	0.021 (0.025)	0.063** (0.031)
	1995	0.049** (0.024)	0.127*** (0.036)
Sec6	**1991**	0.041*** (0.013)	0.063 (0.023)
	1992	0.031***	0.051**

		(0.012)	(0.027)
	1993	0.050*** (0.012)	0.075*** (0.029)
	1994	0.050*** (0.011)	0.099*** (0.024)
	1995	0.035*** (0.011)	0.111*** (0.023)
Sec7	**1991**	0.125*** (0.021)	0.192*** (0.035)
	1992	0.130*** (0.022)	0.292*** (0.051)
	1993	0.121*** (0.022)	0.262*** (0.051)
	1994	0.111*** (0.019)	0.203*** (0.039)
	1995	0.137*** (0.022)	0.201*** (0.034)
Sec8	**1991**	0.064*** (0.016)	0.055** (0.030)
	1992	0.033* (0.020)	0.056 (0.040)
	1993	0.072*** (0.019)	0.061* (0.035)
	1994	0.051*** (0.014)	0.084*** (0.029)
	1995	0.102*** (0.019)	0.135*** (0.034)
Sec9	**1991**	0.082*** (0.014)	0.164*** (0.030)
	1992	0.062*** (0.014)	0.163*** (0.029)
	1993	0.101*** (0.015)	0.090*** (0.025)
	1994	0.091*** (0.012)	0.070*** (0.026)
	1995	0.081*** (0.014)	0.091*** (0.026)
Sec10	**1991**	0.004 (0.044)	0.062 (0.074)
	1992	0.004 (0.058)	0.085 (0.075)
	1993	0.112* (0.062)	0.221 (0.116)
	1994	0.161*** (0.043)	0.112 (0.157)
	1995	0.171*** (0.041)	0.199 (0.165)
Sec11	**1991**	0.043*** (0.009)	0.087*** (0.016)
	1992	0.035*** (0.009)	0.084*** (0.018)
	1993	0.095*** (0.025)	0.079*** (0.024)
	1994	0.480*** (0.031)	0.136 (0.101)
	1995	0.496*** (0.028)	0.038 (0.072)
Sec12	**1991**	0.060*** (0.015)	0.068*** (0.028)

	1992	0.038***	0.063**
		(0.013)	(0.031)
	1993	0.093**	0.166***
		(0.041)	(0.044)
	1994	0.570***	0.110
		(0.053)	(0.174)
	1995	0.554***	0.124
		(0.048)	(0.267)
Sec13	**1991**	0.069***	0.158***
		(0.017)	(0.031)
	1992	0.092***	0.136***
		(0.017)	(0.031)
	1993	0.083***	0.127***
		(0.017)	(0.039)
	1994	0.485***	0.191
		(0.037)	(0.105)
	1995	0.504***	0.206***
		(0.037)	(0.090)
Sec14	**1991**	0.006	0.014
		(0.018)	(0.052)
	1992	0.048**	0.022
		(0.024)	(0.022)
	1993	0.019	0.095*
		(0.020)	(0.054)
	1994	0.575***	0.029
		(0.046)	(0.310)
	1995	0.624***	0.057
		(0.053)	(0.184)
Sec15	**1991**	0.092***	0.145***
		(0.017)	(0.034)
	1992	0.077***	0.125***
		(0.019)	(0.036)
	1993	0.061***	0.085***
		(0.018)	(0.028)
	1994	0.092***	0.076**
		(0.023)	(0.037)
	1995	0.093***	0.099***
		(0.021)	(0.041)

***Significant at 1%; **Significant at 5%; *Significant at 10%. Robust standard errors in parentheses. All variables are expressed as natural logarithms.

Table 8 Second stage: summary Statistics

Explanatory variable	Number of observations	Sample mean	Sample std. dev.	Sample minimum	Sample maximum	Effect on bargaining power
Trade variables						
Import/production	75	1.05	1.20	0.17	5.76	B < 0
Export/production	75	0.47	0.61	0.02	2.26	B > 0
Outsourcing narrow[(a)]	30	0.17	0.12	0.002	0.48	B < 0
Outsourcing broad	30	0.36	0.10	0.14	0.60	B < 0
Tariffs	30					B > 0
Inward foreign direct investment variables						
Relative number of foreign-owned firms	75	0.08	0.07	0.01	0.28	B > 0 or B < 0
Relative employment of foreign-owned firms	75	0.40	0.22	0.05	0.77	B > 0 or B < 0
Relative value added of foreign-owned firms	75	0.44	0.23	0.05	0.84	B > 0 or B < 0
Technology variables						
R&D/output	75	0.08	0.07	0.01	0.28	B > 0 or B < 0
(Patents* mia)/output	75	0.40	0.22	0.05	0.77	B > 0 or B < 0
% change in TFP	75	0.44	0.23	0.05	0.84	B > 0 or B < 0
Control variables						
Unemployment rate	75	0.13	0.06	0.03	0.34	B < 0
C5- concentration ratio	75	0.34	0.17	0.12	0.77	B > 0 or B < 0
Capacity utilisation[(b)]	70	0.77	0.03	0.70	0.86	B > 0

(a) These data were only available for the years 1991 and 1995.
(b) Sector 49 of the NACE-70 was dropped because of data limitations.
Source: Own computation based on data described in Appendix B.

Table 9 Second stage regression results: determinants of the workers' relative bargaining power

Explanatory variable	Effect on bargaining power	No controls	Industry fixed effects	Time fixed effects	Industry & time fixed effects	Number of observations
Trade variables						
Import/production	B < 0	-0.002 (0.003)	-0.03*** (0.01)	-0.001 (0.003)	-0.03** (0.01)	75
Export/production	B > 0	0.01 (0.01)	0.08 (0.05)	0.01 (0.01)	0.16*** (0.05)	75
Outsourcing narrow[(a)]	B < 0	0.05 (0.08)	0.20 (0.12)	0.04 (0.08)	0.04 (0.17)	30
Outsourcing broad	B < 0	-0.05 (0.09)	0.03 (0.11)	-0.003 (0.01)	0.02 (0.16)	30
Tariffs	B > 0	0.55*** (0.16)	1.57* (0.80)	0.50 (0.10)	1.10 (1.78)	30
Inward foreign direct investment variables						
Relative number of foreign-owned firms	B > 0 or B < 0	0.15 (0.09)	-1.83** (0.77)	0.15 (0.09)	-2.29*** (0.85)	75
Relative employment of foreign-owned firms	B > 0 or B < 0	0.02 (0.02)	0.004 (0.43)	0.02 (0.02)	0.02 (0.43)	75
Relative value added of foreign-owned firms	B > 0 or B < 0	0.02 (0.02)	-0.12 (0.24)	0.02 (0.02)	-0.15 (0.22)	75
Technology variables						
R&D/output	B > 0 or B < 0	0.95*** (0.32)	4.73* (2.76)	0.97*** (0.30)	7.73* (4.14)	75
(Patents* mia)/output	B > 0 or B < 0	-0.23** (0.09)	-0.11 (0.10)	-0.22** (0.10)	-0.09 (0.13)	75
% change in TFP	B > 0 or B < 0	0.06* (0.03)	0.02 (0.02)	0.07* (0.04)	0.03 (0.02)	75
Control variables						
Unemployment rate	B < 0	0.14* (1.93)	0.02 (0.07)	0.14* (0.07)	-0.001 (0.22)	75
C5- concentration ratio	B > 0 or B < 0	0.001 (0.02)	-0.01 (0.01)	0.004 (0.02)	-0.01 (0.01)	75
Capacity utilisation[(b)]	B > 0	-0.22** (0.12)	-0.01 (0.12)	-0.27** (0.13)	-0.01 (0.20)	70

***Significant at 1%; **Significant at 5%; *Significant at 10%. Robust standard errors in parentheses.

(a) These data were only available for the years 1991 and 1995.

(b) Sector 49 of the NACE-70 was dropped because of data limitations.

Appendix A

Table A.1. Sectoral classification for the first stage regressions

	Sector	NACE-70	NACE-Bel
Sec 1	Food, beverages and tobacco	41+42	15+16
Sec 2	Textiles	43	17
Sec 3	Wearing apparel and leather and products	44+45	18+19
Sec 4	Wood products and furniture and fixtures	46	20 + 36.1
Sec 5	Manufacture of pulp, paper and board	471+472	21
Sec 6	Printing and allied industries	473+474	22
Sec 7	Chemical industry and man-made fibres	25+26	24
Sec 8	Rubber and plastic products	48	25
Sec 9	Non-metallic mineral products	24	26
Sec 10	Basic metal industries	22	27
Sec 11	Metal products	31	28
Sec 12	Non-electrical machinery	32	29
Sec 13	Office and computing machinery, electrical machinery and professional goods	33+34+37	30-33
Sec 14	Other transport equipment	35+36	34+35
Sec 15	Other manufacturing	49	36-36.1

Appendix B

The sectoral classification for the second stage regressions is based on Table A.1 of Appendix A and covers the period 1991-1995, except for the tariff data and the outsourcing variables.

The data for the trade variables are obtained from the OECD International Trade by Commodities Statistics (ITCS). These data are in the Standard Industrial Trade Classification (SITC) and are converted to the NACE-70 classification with a correspondence table obtained from the OECD. [24] The production data are obtained from the OECD (1999) Stan Database for Industrial Analysis. Our narrow and broad outsourcing variables are derived from the 1990 and 1995 input-output tables for the Belgian economy.[25] The data for 1990 are in the NACE-clio classification for which a conversion was used, while the data for 1995 are in the NACE-bel classification (see Table A. of Appendix A for a conversion to the NACE-70 classification). The tariff data are based on Messerlin (2001) and refer to the average Most Favoured Nation (MFN) tariffs of the European Union. These tariff data cover the years 1990 and 1995. Also, for some sectors the data are more disaggregated than the sectoral classification of Table A.1.. Hence, we used sectoral import shares as a weight to construct tariff data based on the classification based on this table.

Regarding inward foreign direct investment, we experimented with three variables: the number of foreign-owned companies relative to the total number of companies, the total employment of foreign-owned firms relative to the total Belgian employment and the total value added of foreign-owned firms relative to the total Belgian value added for each manufacturing sector. The Belgian Federal Planning gathers data on all multinationals firms in the Belgian economy. A multinational firm is defined as a firm that is at least 50% foreign-owned and is in contrast to the literature which applies a 10% threshold (see De Backer, 2002, and De Backer and Sleuwaegen, 2003, for a further description of this data set).

We experiment with three technology variables. We use the sectoral R&D intensity, which is defined as R&D expenditures divided by output as a measure for innovative input. The R&D data are obtained from the Dienst voor Wetenschappelijke, Technische en Culturele Aangelegenheden (DWTC, Belgian Federal Science Policy Office). [26] For the years 1990 and 1991, missing observations are filled in with the aid of a spline interpolation technique. The data are in the NACE-Bel classification and are converted to the NACE-70 classification

[24] The data were first converted through the International Industrial Classification (ISIC) and subsequently converted to the NACE-70 based on Schumacher (1992).
[25] See http://www.plan.be/.
[26] See http://www.belspo.be/

based on NIS (1997). The production data are obtained from the OECD (1999) Stan Database for Industrial Analysis. We also experiment with granted patent data that are a measure of innovative output. These patent data are obtained from the EPO (European Patent Office) and are converted to the NACE-70 classification based on the conversion table of Verspagen et al. (1994).[27] The patent variable used is patents divided by production times milliards. A third technology variable is Total Factor Productivity (TFP) that reflects a measure of productivity. This variable is expressed into indices where 1990 is the base year. The percentage change of the total factor productivity can be expressed as follows:

$$\hat{A} = \left(\hat{Q} - \hat{L}\right) - \alpha\left(\hat{K} - \hat{L}\right) \qquad \textbf{(B.1.)}$$

In this expression, the first term refers to the percentage change in the output labour ratio. In the second term, α refers to the capital share in production. Therefore, $(1-\alpha)$ refers to the labour share in production, which is calculated as the average share of labour costs in value added. $\left(\hat{K} - \hat{L}\right)$ refers to the percentage change in the capital-labour ratio. We constructed our capital stock data starting from real investment data from the OECD (1999) Stan Database for Industrial Analysis and using a perpetual inventory method following Griliches (1979).[28] We first compute an initial capital stock for 1990. If we assume that both the depreciation rate (δ) and the annual growth rate (η) of investments prior to 1990 are constant, the initial capital stock K_{1990} equals:

$$\begin{aligned} K_{1990} &= I_{1990} + (1-\delta)\lambda I_{1990} + (1-\delta)^2 \lambda^2 I_{1990} + (1-\delta)^3 \lambda^3 I_{1990} \qquad \textbf{(B.2)} \\ &= I_{1990}\left(\frac{1}{1-\lambda(1-\delta)}\right) \end{aligned}$$

where $\lambda = 1/(1+\eta)$. The growth rate η is estimated as the mean annual growth rate of investments over the period 1985-1990. Like Maskus (1991), we use a depreciation rate of 13.33 percent. After having obtained the initial capital stock, deflated investment series are accumulated and depreciated from 1990 onwards. The deflators are calculated from the value added series in the OECD (1999) Stan database.

The sectoral unemployment rate is a first control variable and is obtained from the Rijksdienst voor Arbeidsvoorziening (RVA). Another variable is the C5- concentration ratio which refers

[27] Again, the conversion has occurred through the ISIC-classification.
[28] A more complete description of how the capital series are constructed is available from the authors upon request.

to the five-firm concentration ratio and is computed with the aid from the Belgian National Bank Balance sheet data using the sales variable. As a last control variable, we use the capacity utilisation rate, which is obtained from the Belgostat database of the Belgian National Bank.[29] These data are provided quarterly and are disaggregated according different sectors in the manufacturing sector that is more disaggregated for some sectors of Table X. First, we compute the average utilisation rate in each sector[30]. Some sectors are aggregated up using the value of production as weights. The sector "Other Manufacturing" (sector 49 of the NACE-70) was lacking so we therefore did not use this sector in our estimations.

[29] These data can be downloaded from http://www.nbb.be/belgostat/.
[30] Doing this, we also filter out seasonal fluctuations when we take averages. Another option would be to use a filtering technique such as the Census X-11 method.

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